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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/695,061	10/28/2003	Seong-Ho Kim	5649-1168	5437
7590 02/09/2005			EXAMINER	
Julie H. Richardson, Esq. Myers Bigel Sibley & Sajovec, P.A. P.O. Box 37428 Raleigh, NC 27627			LANDAU, MATTHEW C	
			ART UNIT	PAPER NUMBER
			2815	

DATE MAILED: 02/09/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/695,061

Applicant(s)

KIM ET AL.

Examiner

Matthew Landau

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 07 January 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-7 and 27-35 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 1-7 is/are allowed.
- 6) ☒ Claim(s) 27-29, 32, 33, and 35 is/are rejected.
- 7) ☒ Claim(s) 30, 31 and 34 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 28 October 2003 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
- 1) ☒ Certified copies of the priority documents have been received.
 - 2) ☐ Certified copies of the priority documents have been received in Application No. _____.
 - 3) ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>8/2/2004</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION***Drawings***

The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the bottom surface of the gate electrodes contacting the semiconductor substrate (claim 31) must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Objections

Claim 32 is objected to because of the following informalities: the limitation “the first and gate electrodes” should be changed to “the first and second gate electrodes”.

Appropriate correction is required.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 27-29 and 35 are rejected under 35 U.S.C. 102(b) as being anticipated by Wu et al. (US Pat. 6,294,449, hereinafter Wu).

Regarding claim 27, Figure 7 of Wu discloses a plurality of gate electrodes 30 disposed on a substrate 10, the gate electrodes having opposing sidewalls and top and bottom surfaces, wherein portions of selected adjacent sidewalls of neighboring electrodes angle generally downwardly and inwardly toward each other while the opposing sidewall of each of the selected sidewalls are substantially linear.

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Regarding claim 28, Figure 7 of Wu discloses a plurality of elongate contact windows, a respective one positioned between the selected sidewalls of neighboring electrodes 30, wherein the contact window sidewalls comprise an angled profile (near the bottom) that correspond to the angled gate electrode sidewall configuration; and a contact pad 110 disposed in each contact window, the contact pad extending generally downwardly and having a length (height) that is greater than the height of the gate electrode. Note that Wu discloses the device is used in an array (col. 2, lines 3-10), therefore there must be more than one contact.

Regarding claim 29, Figure 7 of Wu discloses a gate protection liner layer 135 that extends in the contact window and covers the angled sidewall portion of a respective gate electrode; and a first liner layer 55 that covers the remaining surfaces of the top and opposing sidewalls of the respective gate electrode.

Regarding claim 35, Figure 7 of Wu discloses a conductive contact 110 on a substrate 10 in a recess (recess in dielectric layer 60) adjacent to a gate electrode 30 having an opposing top and bottom and a gate electrode sidewall that extends from a top surface to the bottom of the sidewall, the gate electrode sidewall angling inwardly from the top surface to an intermediate portion of the sidewall (middle point of sidewall) toward the recess with a lower portion of the sidewall being substantially straight so that the bottom of the electrode has a greater width than the top, the conductive contact having a profile that includes the angled shape of the gate electrode sidewall and an upper portion that extends above the top surface of the gate electrode.

Claims 27, 28, and 35 are rejected under 35 U.S.C. 102(e) as being anticipated by Cronin et al. (US Pat. 6,734,564, hereinafter Cronin).

Regarding claim 27, Figures 4 and 5a-5c of Cronin disclose a plurality of gate electrodes 20/22 disposed on a substrate, the gate electrodes having opposing sidewalls and top and bottom surfaces, wherein portions of selected adjacent sidewalls of neighboring electrodes angle generally downwardly and inwardly toward each other while the opposing sidewall of each of the selected sidewalls are substantially linear. Note that Cronin discloses conductive lines 42 and 44, which correspond to conductors 20/22, are gates (col. 4, lines 17-21).

Regarding claim 28, Figures 5a-5c of Cronin disclose a plurality of elongate contact windows 78, a respective one positioned between the selected sidewalls of neighboring electrodes 20/22, wherein the contact window sidewalls comprise an angled profile (near the bottom) that correspond to the angled gate electrode sidewall configuration; and a contact pad 92 disposed in each contact window, the contact pad extending generally downwardly and having a length (height) that is greater than the height of the gate electrode.

Regarding claim 35, Figures 5a-5c of Cronin disclose a conductive contact 92 on a substrate in a recess 78 (recess in insulating layer 14) adjacent to a gate electrode 20 having an opposing top and bottom and a gate electrode sidewall that extends from a top surface to the bottom of the sidewall, the gate electrode sidewall angling inwardly from the top surface to an intermediate portion of the sidewall (middle point of sidewall) toward the recess with a lower portion of the sidewall being substantially straight so that the bottom of the electrode has a greater width than the top, the conductive contact having a profile that includes the angled shape of the gate electrode sidewall and an upper portion that extends above the top surface of the gate electrode. Note that the entire gate sidewall is straight and angled toward the recess. Therefore, the “intermediate portion” can be any portion along the sidewall.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 32 and 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wu in view of Lee et al. (US PGPub 2002/0195672, hereinafter Lee).

Regarding claim 32, Figure 7 of Wu discloses first and second gate electrodes 30 disposed on a semiconductor substrate 10, the first and second gate electrodes having opposing first and second sidewalls and top and bottom surfaces, wherein portions of the adjacent sidewalls of the first and second gate electrodes are configured to angle generally downwardly and inwardly toward each other; a contact window positioned between the adjacent sidewalls of the first and second gate electrodes, wherein the contact window sidewalls comprise an angled profile that correspond to the angled gate electrode sidewalls; and a contact pad 110 disposed in the contact window, the contact pad extending generally downwardly and having a length (height) that is greater than the height of the gate electrode. The difference between Wu and the claimed invention is a peripheral circuit region comprising a gate electrode; lightly doped impurity regions on each side of the gate, and heavily doped impurity regions surrounding the lightly doped regions (i.e., an LDD structure). Figure 3 of Lee discloses a peripheral circuit region b comprising a gate electrode 19 with an LDD structure. In view of such teaching, it

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would have been obvious to the ordinary artisan at the time the invention was made to modify the invention of Wu by including a peripheral circuit region including a gate with an LDD structure for the purpose of integrating different types of transistors on the same chip, while reducing short channel effects in the peripheral transistor(s).

Regarding claim 33, Figure 7 of Wu discloses a gate protection liner layer 135 that extends along the sidewalls of the contact window and covers the angled sidewall portion of a respective gate electrode 30 in the cell array region; and a first liner layer 55 that covers target surfaces of the gate electrodes disposed in the cell array region.

Allowable Subject Matter

Claims 1-7 are allowed.

Claims 30, 31, and 34 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is an examiner's statement of reasons for allowance:

Regarding claim 1, the prior art of record, either singularly or in combination, does not disclose or suggest the combination of limitations including a first liner layer that is disposed on the semiconductor substrate and covers one of the first and second sidewalls, a minor portion of the other sidewall, and a major portion of the top surface of the gate electrode.

The following is a statement of reasons for the indication of allowable subject matter:

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Regarding claim 30, the prior art of record, either singularly or in combination, does not disclose or suggest the combination of limitations including wherein the first liner layer covers: (a) greater than a major portion of the top surface of both the first and second gate electrodes; (b) a minor portion of the second sidewall of the first gate electrode and minor portion of the first sidewall of the second gate electrode; and (c) the entire length of the first sidewall of the first electrode and the second sidewall of the second electrode.

Regarding claim 31, the prior art of record, either singularly or in combination, does not disclose or suggest the combination of limitations including the bottom surface of the gate electrodes contact the semiconductor substrate.

Regarding claim 34, the prior art of record, either singularly or in combination, does not disclose or suggest the combination of limitations including a buffer insulation layer disposed in an upper and/or intermediate portion of the contact window intermediate the contact pad and the gate protection liner layer.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew C. Landau whose telephone number is (571) 272-1731.

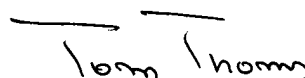
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The examiner can normally be reached from 8:30 AM - 5:30 PM. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on (571) 272-1664. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9306 for regular communications and (703) 872-9306 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

Matthew C. Landau

Examiner



TOM THOMAS

SUPERVISORY PATENT EXAMINER

February 3, 2005